



Leibniz Institute for Baltic Sea Research Warnemünde

C r u i s e R e p o r t

r/v "Alkor"

Cruise-No. 06AK/10/03

Monitoring Cruise
16 July – 25 July 2010
Kiel Bight to Northern Baltic Proper

This report is based on preliminary data

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1. **Cruise No.:** 06AK/10/03
2. **Dates of the cruise:** from 16 July to 25 July 2010
3. **Particulars of the research vessel:**
Name: "Alkor"
Nationality: Germany
Operating Authority: Leibniz Institute of Marine Sciences at Kiel University (IFM-GEOMAR)
4. **Geographical area in which ship has operated:**
Kiel Bight to Northern Baltic Proper
5. **Dates and names of ports of call**
18./19.06.2010: Saßnitz
6. **Purpose of the cruise**
Baltic monitoring in the frame of the COMBINE Programme of HELCOM
7. **Crew:**
Name of master: Norbert Hechler
Number of crew: 10
8. **Research staff:**
Chief scientist: Dr. N. Wasmund

Participants: Donath, Jan
Weinreben, Stefan
Hennings, Ursula
Trost, Erika
Lerz, Astrid
Tschakste, Andrea
Trinkler, Sven
Goldstein, Josephine
Wagner, Carola
Heene, Christian

9. **Co-operating institutions:**
All institutions dealing with HELCOM monitoring programmes.

10. **Scientific equipment**
CTD, water samplers, plankton nets, in-situ-pump

11. General remarks and preliminary results

The area under investigation extended from Kiel Bight to the Northern Gotland Sea (station map see Figs. 1 and 2). On the way back, selected HELCOM stations in the Bornholm Sea, Arkona Sea and Mecklenburg Bight were sampled a second time for nutrient and phytoplankton data. The meteorological, hydrographical, chemical and biological investigations were performed according to the Manual of the COMBINE Programme of HELCOM.

The cruise was divided into two parts. The first part covered the western Baltic and the Arkona Sea and ended on 18 July. Two participants, whose tasks were fulfilled, left the ship. The ship continued the cruise on 19 July with its track into the Bornholm Sea, Eastern Gotland Sea, northern Baltic Proper and Western Gotland Sea.

The weather was sunny and warm (up to 25 °C air temperature) with easterly wind up to 7 m/s and air pressure of 1014-1016 hPa on 16.7.09. The period of 17.7. to 18.7.2010 started cloudy with a change to westerly winds (up to 12 m/s) and to sunny and high-pressure conditions (up to 1026 hPa). It stayed sunny and warm until 22.7.2010, with southerly winds. The wind speed increased to 10 m/s on 22.7.2010 together with a quick drop in air pressure from 1017 to 1009 hPa, but both air pressure and wind speed increased on 23.7.2010 (1017 hPa and 14 m/s, respectively, with sudden change to north-eastern direction). The weather was worst in the morning of the 24.7.2010, with rain and strong wind (18 m/s) from north. It improved on 25.7.2010.

As wind-induced mixing was weak at the beginning of the cruise, there was almost no homogenous surface layer found in sheltered areas (Lübeck Bight). In open areas of Kiel Bight and Mecklenburg Bight, the mixed layer extended to 6-7 m depth, and in the central Arkona Sea to 7-12 m. The halocline became deeper and more distinct from west to east. It started at a depth of 6 m in Kiel Bight, 14 m in Kadet Channel (stat. TF0046) and 18 m at Darss Sill (stat. TF0030). At station TF0115 (in the western Arkona Sea), the water column was complete mixed to the bottom (28 m). In the deeper regions of the Arkona Sea, the halocline started at 38 m depth. In the Bornholm Basin, the thermocline started at 8-10 m depth and the halocline at 45-50 m depth. Oxygen concentrations became zero below approximately 85 m depth in the Bornholm Basin. In the Eastern Gotland Basin, the halocline was located at 55-60 m depth and the oxicleine at 120-135 m depth. The depth of the oxicleine was further raised in the other basins: Farö Deep 115 m, Landsort Deep 68 m, Karlsö Deep 58 m (cf. Fig. 4c; "negative oxygen" due to H₂S see Fig. 5).

The surface water temperatures (0-10 m) of selected stations of this cruise are compared with long-term mean values (1971-1990, numbers in brackets) collected during our summer cruises (end of July-beginning of August) in earlier decades in the table below. The recent water temperature data are in all cases higher:

<u>Area:</u>	<u>2010:</u>	<u>(1971-1990):</u>
Mecklenburg Bight (stat. TF0012)	19.0 °C	(17.7 °C)
Arkona Sea (stat. TF0113)	22.6 °C	(17.0 °C)
Bornholm Sea (stat. TF0213)	18.4 °C	(17.6 °C)
Eastern Gotland Sea (stat. TF0271)	22.0 °C	(17.3 °C)
Farö Deep (stat. TF0286)	20.9 °C	(17.7 °C)
Landsort Deep (stat. TF0284)	19.4 °C	(18.2 °C)
Karlsö Deep (stat. TF0245)	20.9 °C	(16.9 °C)

The long-term trend of increasing water temperature in the deep water layers is continuing in the western and northern deeps but not in the Bornholm and Gotland Deep:.

	<u>July</u> <u>2010</u>	<u>July</u> <u>2007</u>	<u>July</u> <u>2005</u>	<u>July</u> <u>2003</u>	<u>Mean</u> <u>1971-1990</u>
Bornholm Deep	7.53°C	8.80°C	6.97°C	3.71 °C	6.12 °C
Gotland Deep	6.36°C	6.82°C	5.97°C	4.63 °C	5.62 °C
Farö Deep	6.79°C	6.06°C	6.03°C	6.00 °C	5.20 °C
Landsort Deep	6.09°C	5.73°C	5.82°C	5.88 °C	4.76 °C
Karlsö Deep	5.51°C	5.14°C	5.34°C	4.90 °C	4.18 °C

Some aggregates of filamentous Cyanobacteria were suspended in the upper water layer of the north-eastern Arkona Sea (stat. TF0145, TF0144) and in the Bornholm Basin (stat. TF 0210 to stat. TF0221). East of that location, approximately between 16.6 °E and 18.5°E, patches of dense yellow surface mats of *Nodularia spumigena* occurred. North of 55.5 °N, these blooms disappeared, and only a few cyanobacteria aggregates were still found suspended in the water in some areas of the Eastern Gotland Sea. In the western Gotland Sea, no cyanobacteria aggregates were visible.

Attachments

Tables 1& 2: Preliminary results for selected parameters in the surface layer and the near bottom layer (unvalidated results)

Figs. 1-3: Station grid (total grid and two sub-maps)

Fig. 4: Transsect from the Kiel Bight to the Farö Deep for temperature, salinity and oxygen (unvalidated data)

Fig. 5: Oxygen /hydrogen sulphide concentrations in the bottom near layer for selected stations

Dr. Norbert Wasmund

Scientist in charge

Table 1: Surface layer (0 - 10m)

Area	Station	Temperature	Salinity	PO ₄ ³⁻	NO ₂₃ ^{- *}
Date	Name/ No. **	°C	PSU	μmol/dm ³	μmol/dm ³
Kiel Bight 16.7.2010	TF0360/ 006	19.0	12.86	0.00	0.04
Meckl. Bight 16.7.2010	TF0012/ 003	19.0	8.37	0.06	0.04
Lübeck Bight 16.7.2010	TF0022/ 004	18.1	9.56	0.03	0.04
Arkona Basin 17.7.2010	TF0113/ 019	22.6	7.00	0.03	0.04
Bornholm Deep 20.7.2010	TF0213/ 041	18.4	6,96	0.01	0.03
Stolpe Channel 20.7.2010	TF0222/ 043	20.4	7.16	0.01	0.03
SE Gotland Basin 20.7.2010	TF0259/ 045	21.0	7.03	0.03	0.01
Gotland Deep 21.7.2010	TF0271/ 052	22.0	7.00	0.02	0.02
Fårö Deep 22.7.2010	TF0286/ 054	20.9	6.04	0.00	0.01
Landsort Deep 23.7.2010	TF0284/ 056	19.4	5.84	0.00	0.01
Karlsö Deep 23.7.2010	TF0245/ 059	20.9	6.37	0.00	0.01

* $\Sigma \text{NO}_2^- + \text{NO}_3^-$; NO₂ was present only in traces in most areas under investigation

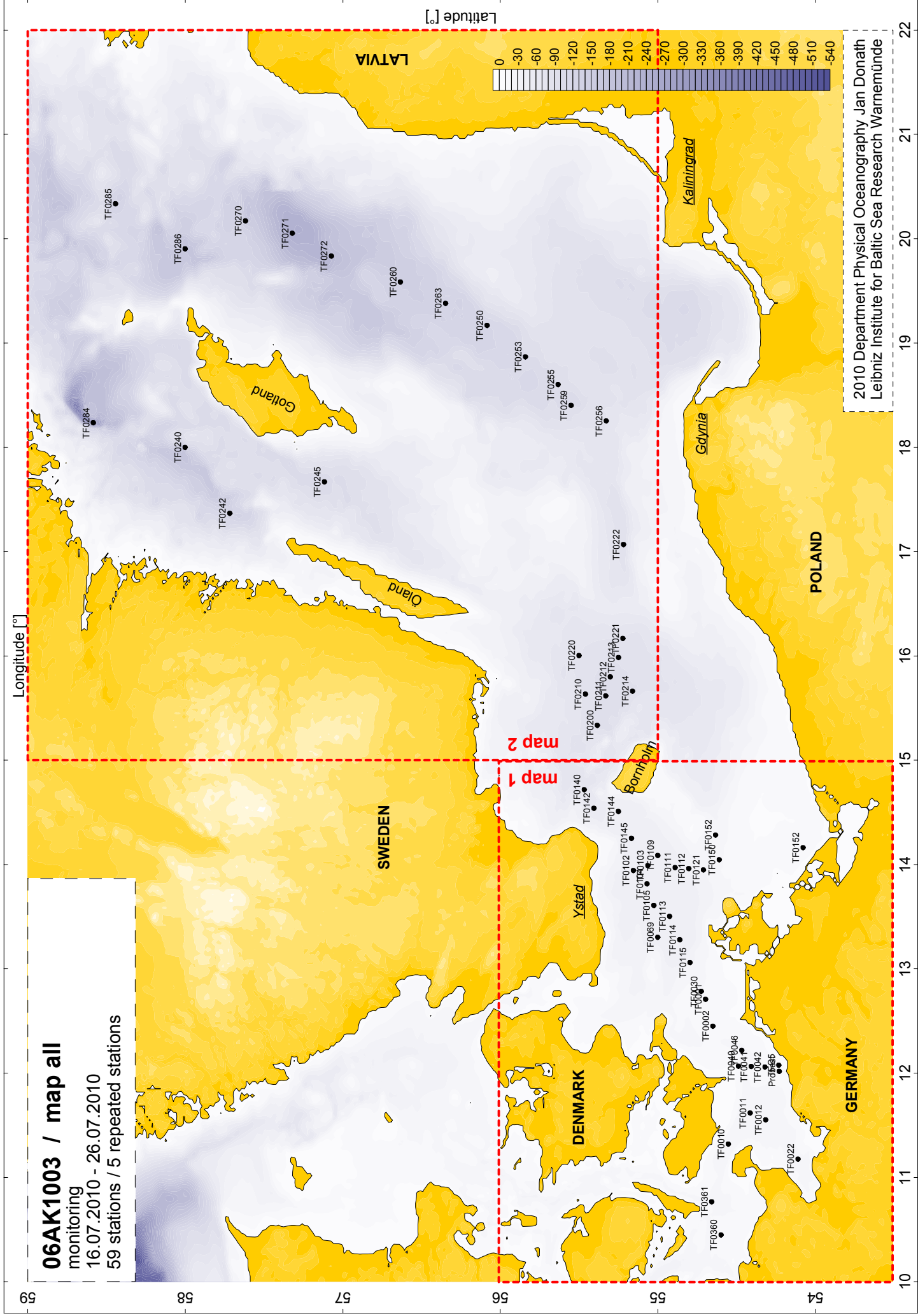
** Station name see maps (Fig. 1 and 2)

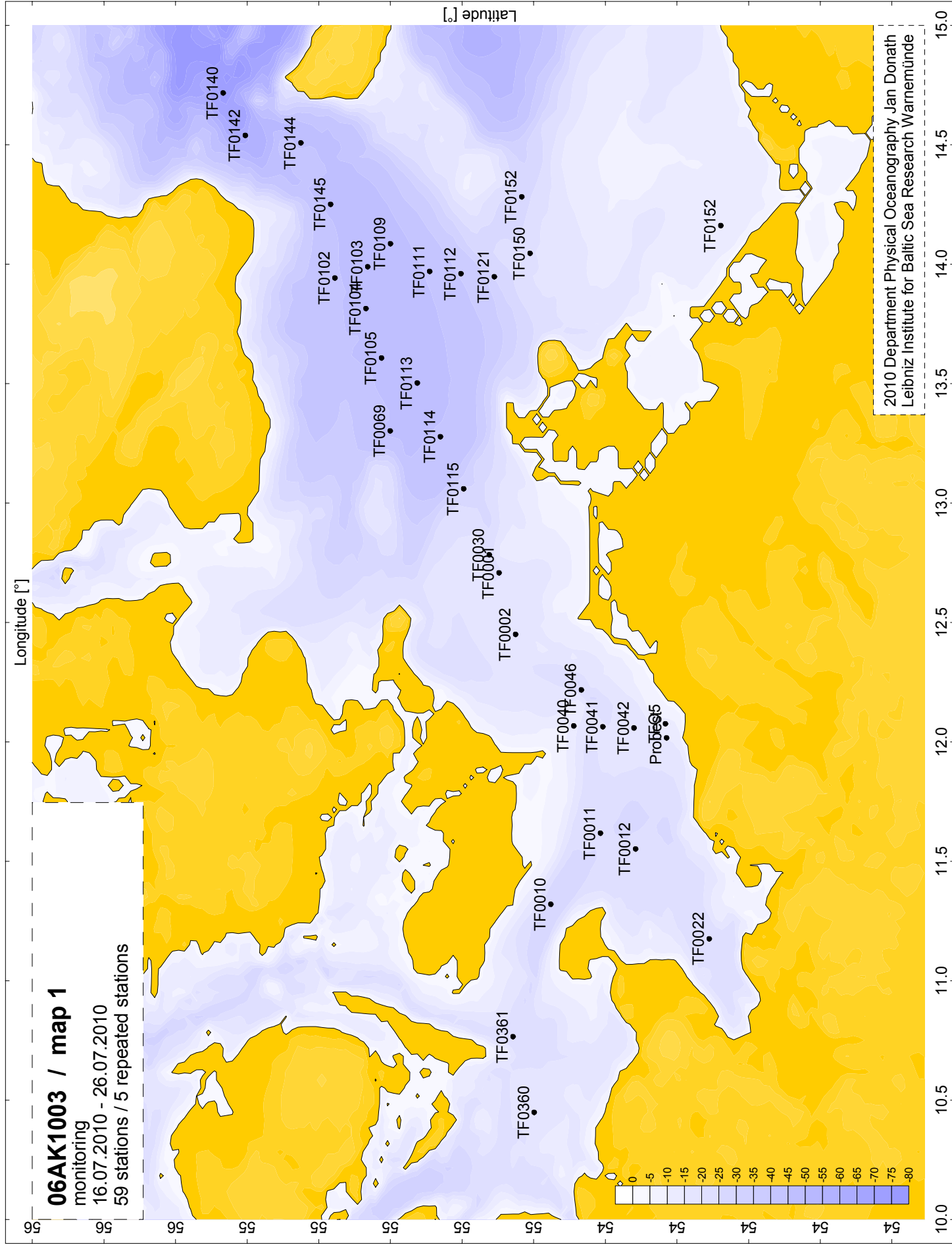
Table 2: Bottom-near water layer

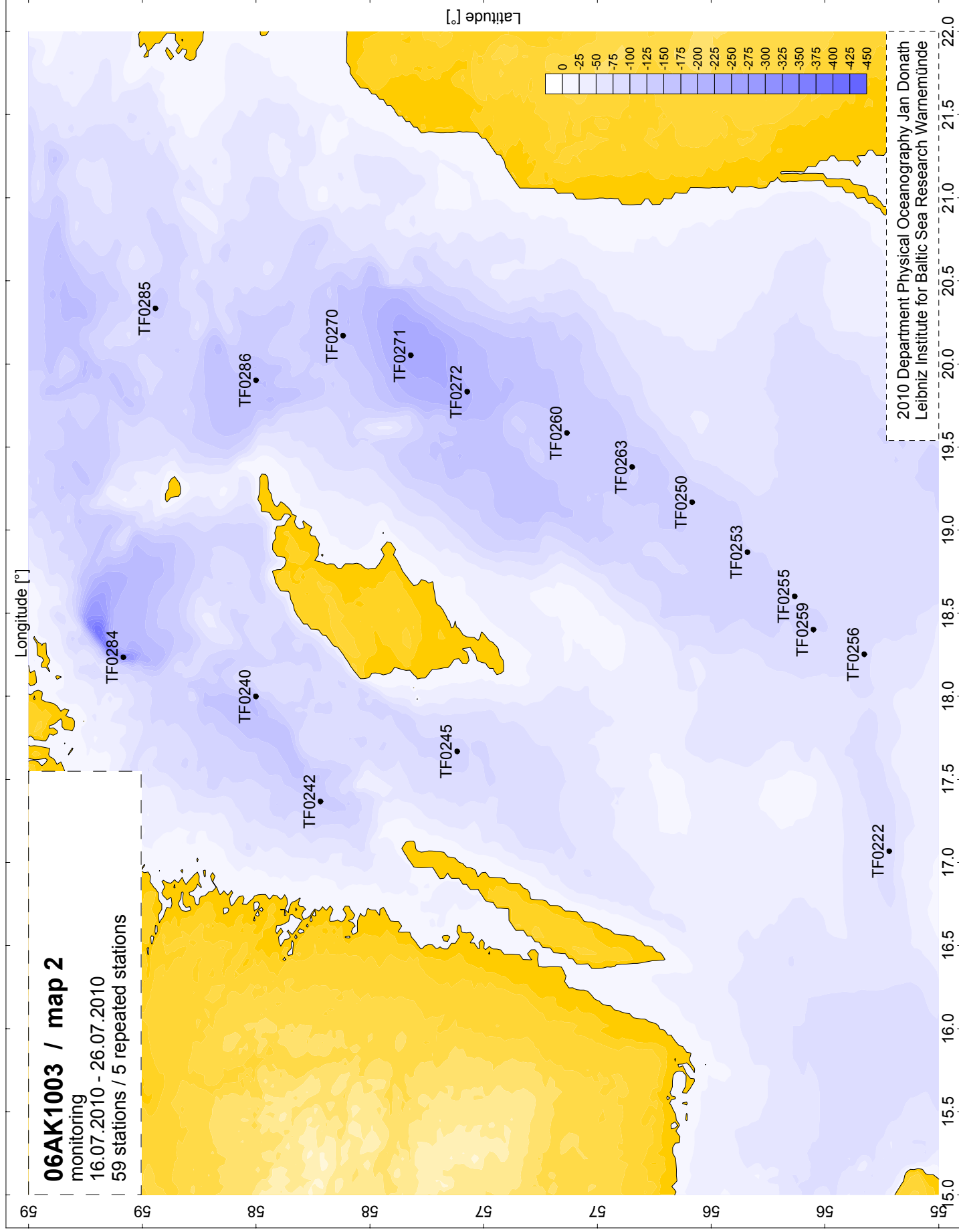
Area	Station	Sampl. Depth	Temp.	Salinity	O ₂	PO ₄ ³⁻	NO ₂₃ ^{-*}
Date	Name/ No. **	m	°C	PSU	cm ³ /dm ³	μmol/dm ³	μmol/dm ³
Kiel Bight 16.7.2010	TF0360/ 006	18	7.37	19.58	3.19	0.68	1.65
Meckl. Bight 16.7.2010	TF0012/ 003	24	8.67	26.12	2.11	1.47	7.63
Lübeck Bight 16.7.2010	TF0022/ 004	22	6.67	21.97	0.90	1.32	5.34
Arkona Basin 17.7.2010	TF0113/ 019	46	5.00	15.84	0.71	1.37	2.57
Bornholm Deep 20.7.2010	TF0213/ 041	88	7.53	16.15	0.09	2.33	8.01
Stolpe Channel 20.7.2010	TF0222/ 043	90	5.22	13.67	2.63	1.77	7.99
SE Gotland Basin 20.7.2010	TF0259/ 045	87	5.80	10.72	0.75	2.60	6.70
Gotland Deep 21.7.2010	TF0271/ 052	234	6.36	12.43	-6.17	5.75	0.28
Fårö Deep 22.7.2010	TF0286/ 054	187	6.79	11.93	-4.22	4.95	0.31
Landsort Deep 23.7.2010	TF0284/ 056	436	6.09	10.77	-1.32	3.70	0.22
Karlsö Deep 23.7.2010	TF0245/ 059	105	5.51	10.19	-2.87	4.35	0.30

* $\Sigma \text{NO}_2^- + \text{NO}_3^-$; NO₂ was present only in traces in most areas under investigation

** Station name see maps (Fig. 1 and 2)







06AK1003

Kiel Bight - Gotland Sea

16.07.2010 19:04 - 22.07.2010 15:02 UTC

